

REMARKS

The present invention is a modelling method for optimizing displacement conditions, in a porous medium wettable by a first wetting fluid, of a three-phase mixture of fluids including the first wetting fluid and at least a second, non-wetting fluid. The method includes determining experimentally a variation curve of capillary pressure in pores of a sample of the porous medium in a presence of the first wetting fluid and of the second non-wetting fluid; modelling the pores of the porous medium by distribution of capillaries with a fractal section by considering a stratified distribution of fluids in the pores, the first wetting fluid spreading out in contact with walls of the pores and around at least one other fluid; determining, from the capillary pressure curve, fractal dimension values corresponding to a series of given values of saturation in liquid phases; modelling hysteresis effects that modify mobile saturations of the fluids displaced in the sample by performing drainage and imbibition cycles on the sample, in order to determine different non-wetting fluid trapping or untrapping constants, the trapping constant or the untrapping constant being used for modelling hysteresis effects according to whether the drainage or the imbibition cycles are carried out; modelling relative permeabilities directly in analytic expressions depending on different fractal dimension values which are obtained; and entering the relative permeabilities into a porous simulator and determining by means of the simulator, optimum displacement conditions for the mixture of fluids in the porous medium. See page 6, lines 1-16, of the original specification for a discussion of United States Patent 6,021,662 and page 6, lines 17-22, and page 7, lines 9-22, through page 8, lines 1-9, of the original specification for a discussion of

hysteresis in the prior art. Moreover, see page 14, lines 8-20, *et seq.* of the original specification for a description of hysteresis modeling in accordance with the present invention.

Claims 1-9 stand rejected under 35 U.S.C. §102 as being anticipated by United States Patent 6,021,662 (Moulu et al). These grounds of rejection are traversed for the following reasons.

The Examiner cites Moulu et al as teaching modelling of hysteresis effects in column 4, lines 26-30, and column 5, line 25 through column 7, line 13. However, while Moulu et al do disclose hysteresis effects being encountered using WAG injection, which involves alternating injections of liquid and gas slugs, as referred to in column 1, lines 13-16, and in column 4, lines 26-30, there is no disclosure in Moulu et al of the claimed modelling hysteresis effects that modify mobile saturations of the fluids displaced in the sample by performing drainage and imbibition cycles on the sample in order to determine different non-wetting fluid trapping or untrapping constants, the trapping constant or the untrapping constant being used for modelling hysteresis effects according to whether the drainage or the imbibition cycles are carried out followed by the claimed modelling and entering steps as recited in claim 1.

In accordance with the present invention, hysteresis is dealt with, as illustrated in Fig. 8, as described on page 14 of the original specification. This disclosure is the basis for the claimed modelling of hysteresis which has no counterpart in Moulu et al.

While Moulu et al do account for hysteresis in performing fractal modelling, the present invention's utilization of non-wetting fluid trapping or untrapping

constants according to whether a drainage or an imbibition cycle is carried out, has no counterpart in Moulu et al. There is no actual modelling of hysteresis disclosed by Moulu et al in accordance with the present invention as explained above and as set forth in claim 1.

The Examiner's reliance upon column 5, line 25 to column 7, line 13, does not suggest to a person of ordinary skill anything about hysteresis. What is described therein is the calculation of relative permeabilities which has a counterpart with the present invention which does not pertain to the claimed modelling of hysteresis effects.

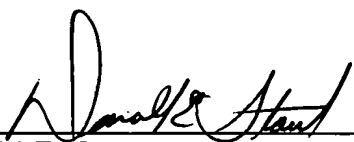
In summary, there is no basis why a person of ordinary skill in the art would be led to modify the teachings of Moulu et al to arrive at the subject matter of the claims except by impermissible hindsight.

Accordingly, early allowance thereof is respectfully requested.

To the extent necessary, Applicants petition for an extension of time under 37 C.F.R. §1.136. Please charge any shortage in fees due in connection with the filing of this paper, including extension of time fees, to Deposit Account No. 01-2135 (612.41232X00) and please credit any excess fees to such Deposit Account.

Respectfully submitted,

ANTONELLI, TERRY, STOUT & KRAUS, LLP



Donald E. Stout
Registration No. 26,422
(703) 312-6600

Attachments

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